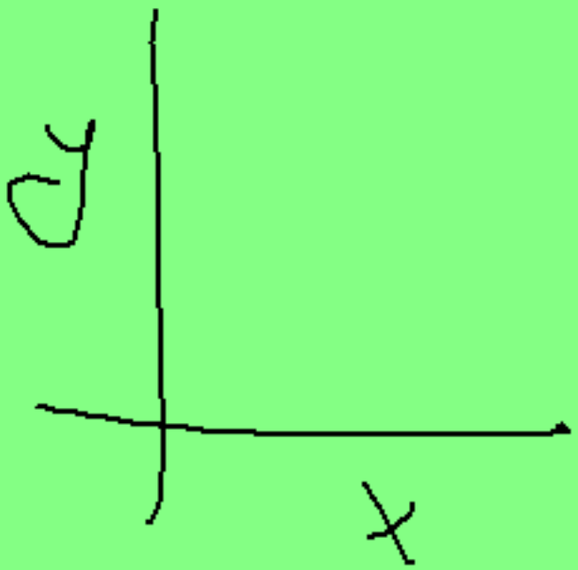
***Complete worksheet 2.4- Association versus Causation***

***Association vs. Causation***

association ≠ causation

high $r, r^2$

strong scatterplot

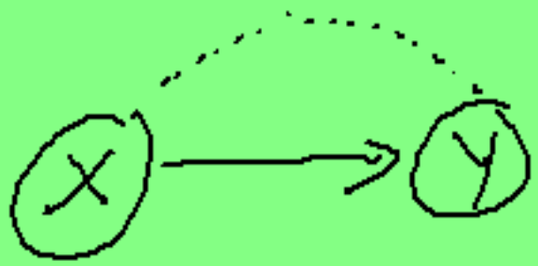


***Types of responses between x and y:*** → assoc (high $r_1 r^2$)

***1) Causation:***

x causes y

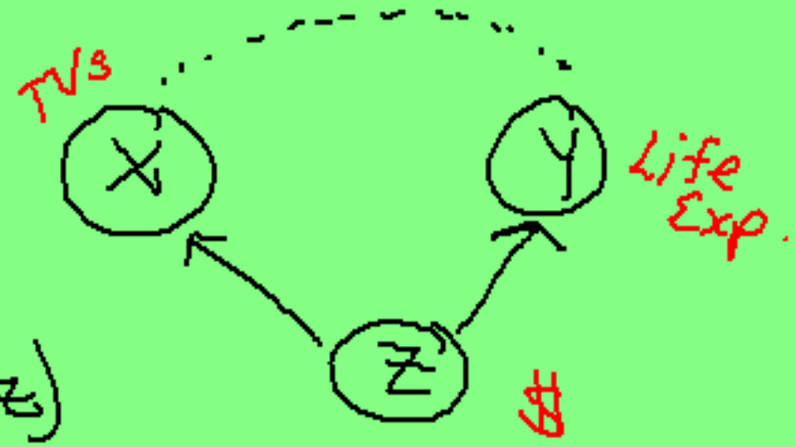
* least likely




..... = assoc.
→ = causation

***2) Common Response:***

y and x are changing due to another, 3rd variable (z)

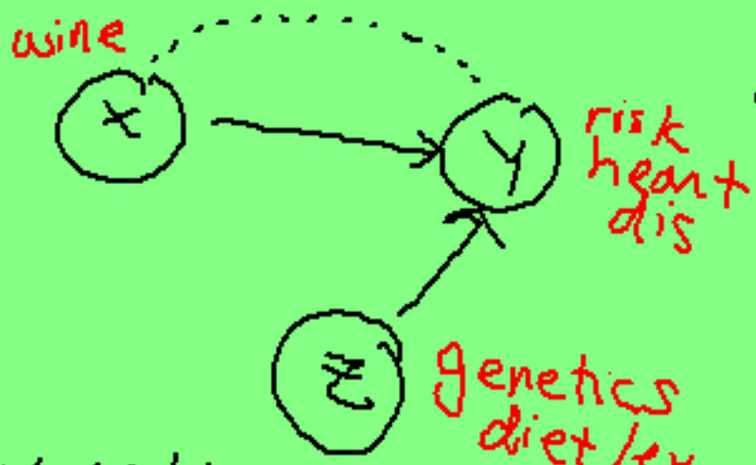



Ex: TV vs. Life Exp

***3) Confounding:***

When a 3rd var. (z) and X-var. both affect y

X and Z are mixed in effect on y




Ex: alcohol vs. heart disease risk

*How can we establish causation?*

through a well-designed expt. (eliminating lurking/confounding vars).

*How can we establish causation when we can do an expt?*

- *the association is* strong (high $r$, $r^2$)
- *the association is* consistent
- *higher doses (values of explanatory variable) ...* correspond w/ higher/extreme responses

- *The alleged cause...* plausible
- *The alleged cause...* precede effect in time
- *<u>EX:</u> Smoking increases lung cancer* ↑ risk of